WALNUT BASIN TOTAL MAXIMUM DAILY LOAD

Waterbody: Walnut River
Water Quality Impairment: Sulfate

1. INTRODUCTION AND PROBLEM IDENTIFICATION

Subbasin: Lower Walnut and Upper Walnut

County: Butler, Cowley, Harvey, Marion, and Sedgwick

HUC 8: 11030018 and 11030017

HUC 11 (HUC 14s):

11030018 **010** (010, 020 and 030)
020 (020 and 070)

11030017 **010** (010, 020, 030, and 040)
020 (010, 020, 030, 040, 050, 060, 070 and 080)(**Figure 2**)

Drainage Area: 681.4 square miles

Main Stem Segments: WQLS: 10, 14, 15 in 11030018 and segment 1 in 11030017 (Walnut River) starting at confluence with Muddy Creek (in northwestern Cowley County) and traveling upstream to headwaters in south Marion County (**Figure 1**).

Tributary Segments:

11030018

WQLS: Eightmile Creek (30)
Fourmile Creek (16)
Spring Branch (32)

11030017

WQLS: Whitewater River (17)
Dry Creek (27)
Whitewater River (18)
Elm Creek (43)
Non-WQLS: Badger Creek (36)
WQLS: W. Br. Whitewater River (24)
Non-WQLS: Whitewater Creek (34)
Prairie Creek (35)
WQLS: W. Br. Whitewater River (25)
Non-WQLS: Wildcat Creek (26)
Sand Creek (29)
W. Wildcat Creek (28)
Gypsum Creek (30)
E. Br. Whitewater Creek (31)
Walnut Creek (44)
WQLS: Whitewater River (19)
Non-WQLS: Rock Creek (37)
Fourmile Creek (20)
WQLS: Whitewater River (21)
Non-WQLS: Dry Creek (32)

WQLS: E. Br. Whitewater River (22)
Whitewater River (23)
Non-WQLS: Henry Creek (33)

Designated Uses: Expected Aquatic Life Support (Special Aquatic Life Support for segment 10 in 11030018), Primary Contact Recreation, Domestic Water Supply; Food Procurement; Ground Water Recharge; Industrial Water Supply Use; Irrigation Use; Livestock Watering Use for Main Stem Segments (10, 14, 15 in 11030018 and segment 1 in 11030017).

11030018 Expected Aquatic Life Support and Secondary Contact Recreation for Tributary Segment 32. Expected Aquatic Life Support, Secondary Contact Recreation (Primary Contact Recreation for segment 16), Domestic Water Supply; Food Procurement; Ground Water Recharge; Industrial Water Supply Use; Irrigation Use; Livestock Watering Use for Tributary Segments 16 and 30.

11030017 Expected Aquatic Life Support and Secondary Contact Recreation for Tributary Segment 27. Expected Aquatic Life Support, Secondary Contact Recreation and Domestic Water Supply for Tributary Segment 43. Expected Aquatic Life Support, Primary Contact Recreation Secondary Contract Recreation for segments 22, 24 and 25), Domestic Water Supply; Food Procurement; Ground Water Recharge; Industrial Water Supply Use; Irrigation Use; Livestock Watering Use for Tributary Segments 17, 18, 19, 21, 22, 23, 24, and 25).

1998 303(d) Listing: Table 1 - Predominant Non-point Source and Point Source Impacts and Table 3 - Predominant Natural Conditions Impact

Impaired Use: Domestic Water Supply (Potentially)

Water Quality Standard: Domestic Water Supply: 250 mg/L at any point of domestic water supply diversion (K.A.R.28-16-28e(c) (3) (A); Livestock Watering: 1,000 mg/L (Table 1a of K.A.R. 28-16-28e(d));

In stream segments where background concentrations of naturally occurring substances, including chlorides and sulfates, exceed the water quality criteria listed in Table 1a of KAR 28-16-28e(d), at ambient flow, the existing water quality shall be maintained, and the newly established numeric criteria shall be the background concentration, as defined in KAR 28-16-28b(e). Background concentrations shall be established using the methods outlined in the "Kansas implementation procedures: surface water quality standards," dated August 6, 2001. (KAR 28-16-28e(b)(9)).

Walnut River Watershed
Sulfate TMDL
Impaired Stream Segment Map

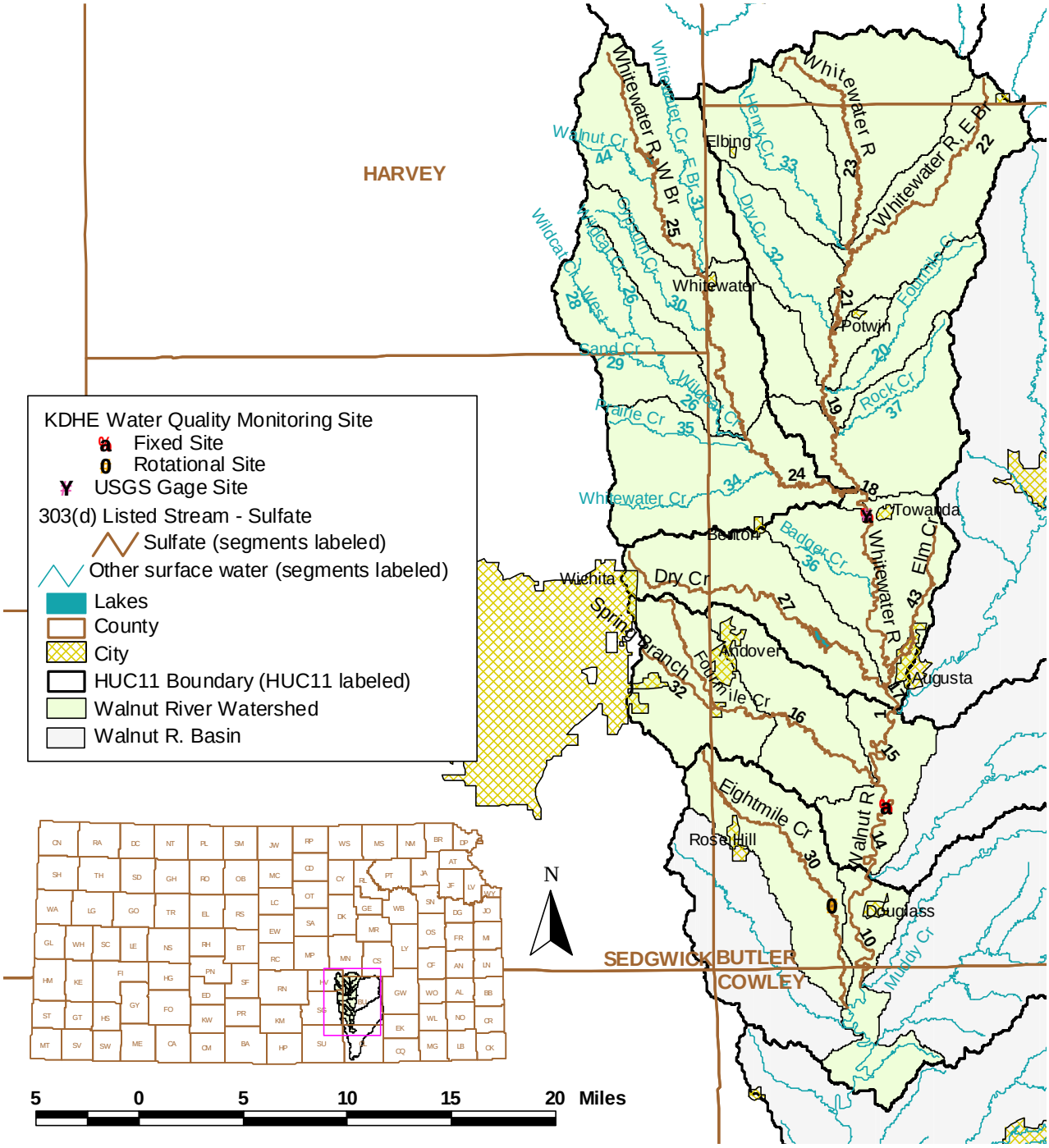

Figure 1

Walnut River Watershed
Sulfate TMDL
HUC Map

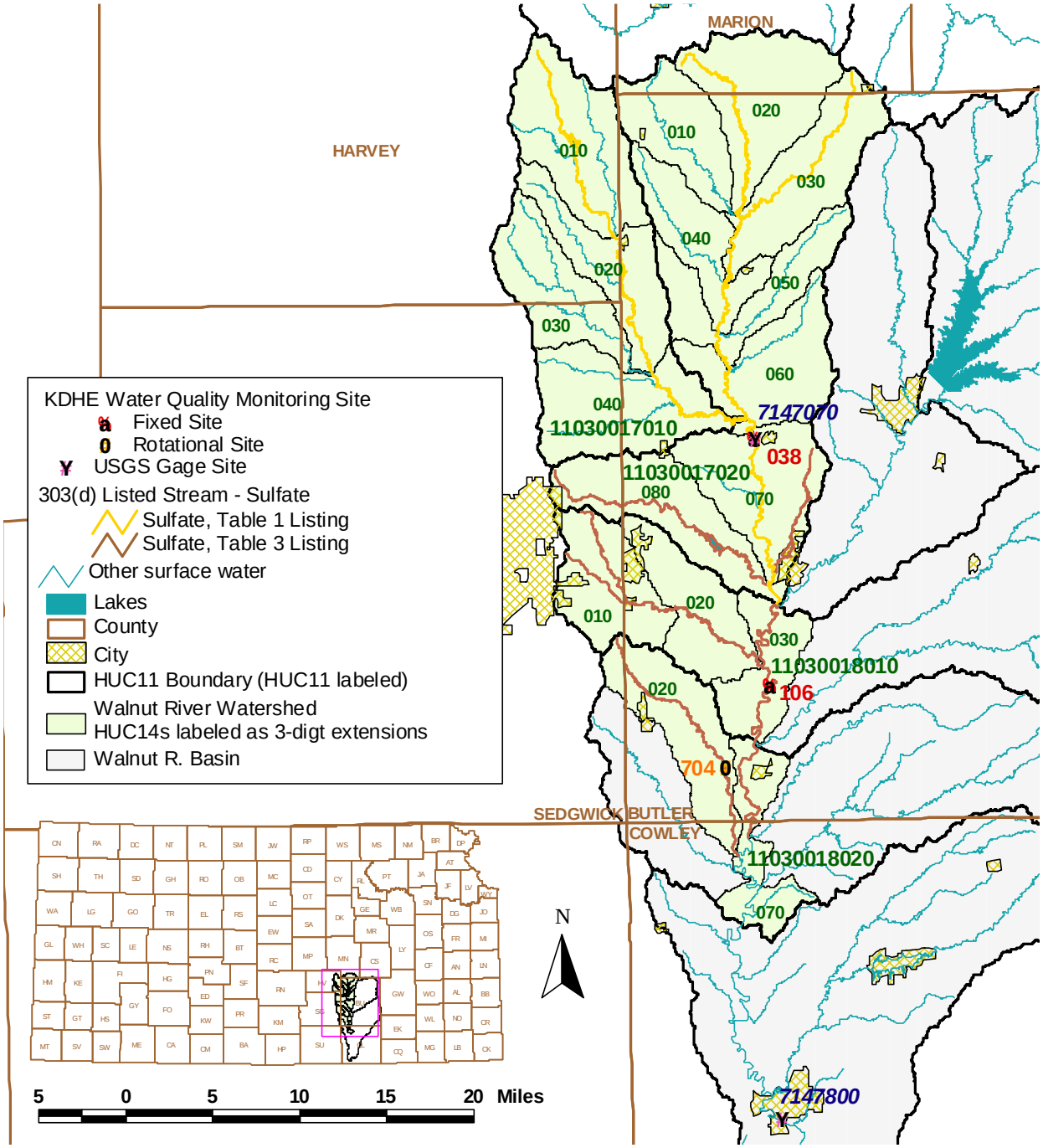

Figure 2

2. CURRENT WATER QUALITY CONDITION AND DESIRED ENDPOINT

Level of Support for Designated Use under 1998 303(d): Not Supporting Domestic Water

Monitoring Sites: Station 038 at Towanda (Whitewater River); Station 106 at Gordon (Walnut River); Station 704 near Douglas (Eightmile Creek) (**Figure 2**)

Period of Record Used: 1985-2000 for Station 038 (**Figure 3**); 1985-2000 for Station 106 (**Figure 4**); 1995 and 1999 for Station 704 (**Figure 5**).

Flow Record: Whitewater River at Towanda (USGS Station 07147070) for Site 038; Walnut River at Winfield (USGS Station 07147800) for Site 106 and rescaled to drainage area for 704.

Long Term Flow Conditions: Median Flows = 36 cfs (Site 038); 125 cfs (Site 106); 5 cfs (Site 704)

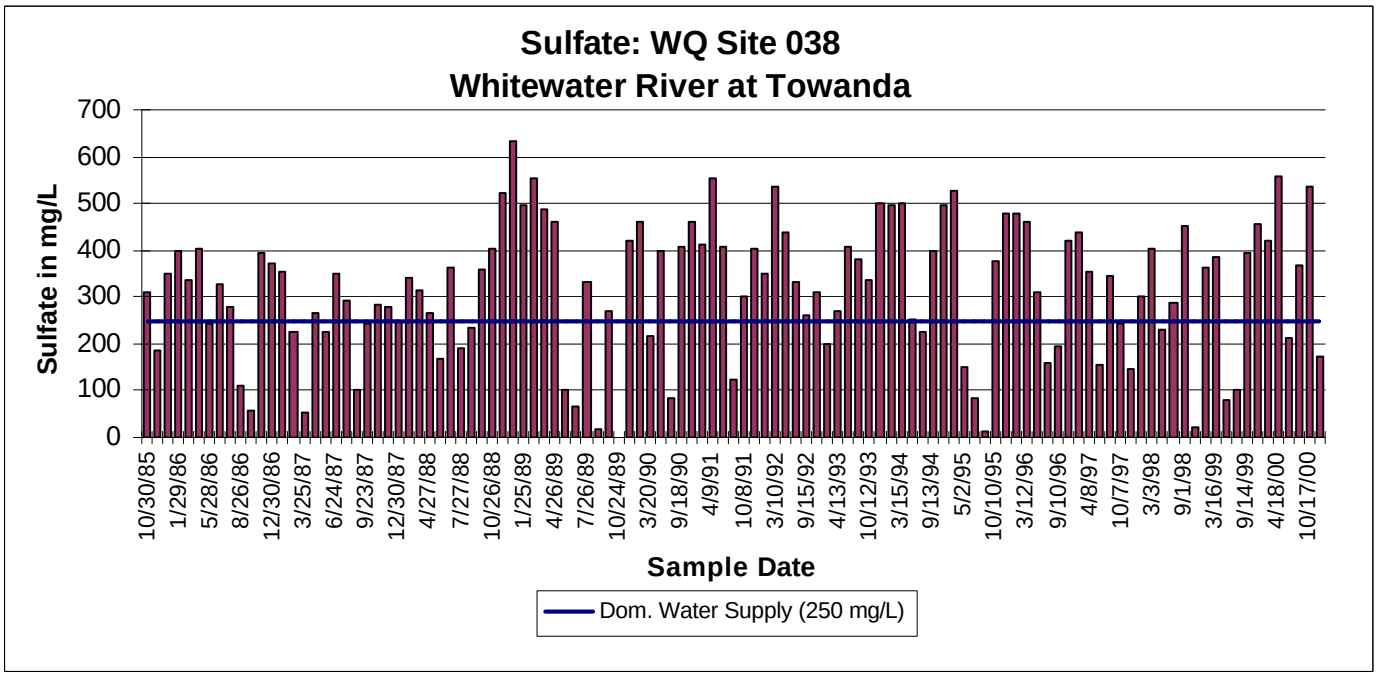

Figure 3

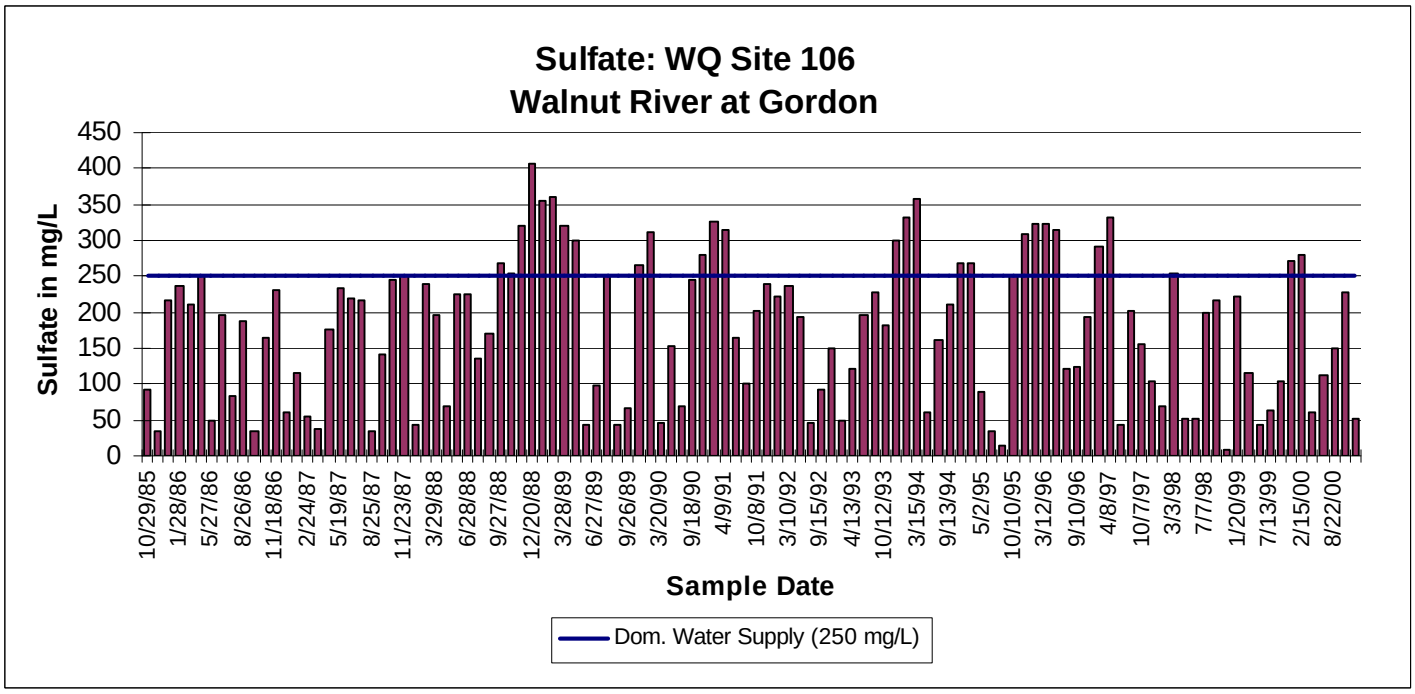

Figure 4

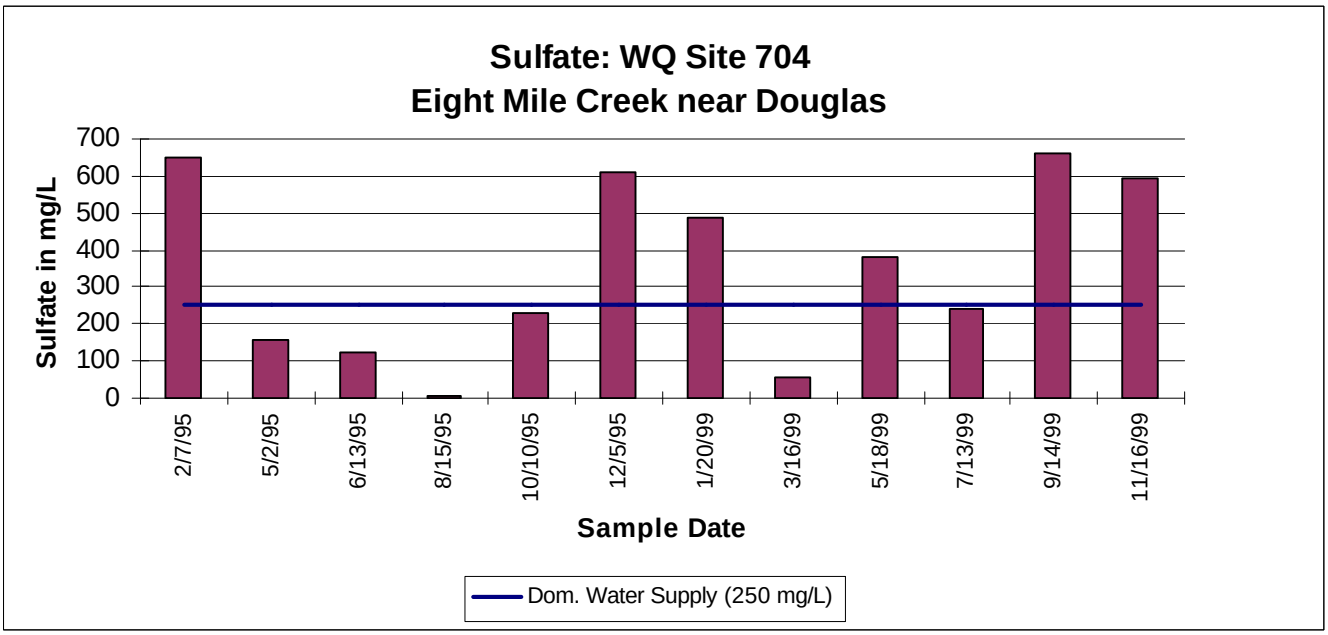

Figure 5

Current Conditions: Since loading capacity varies as a function of the flow present in the stream, this TMDL represents a continuum of desired loads over all flow conditions, rather than fixed at a single value. Sample data for the sampling sites were categorized for each of the three defined seasons: Spring (Apr-Jul), Summer-Fall (Aug-Oct) and Winter (Nov-Mar). High flows and runoff

equate to lower flow durations; baseflow and point source influences generally occur in the 75-99% range. A Load curve was established for the Domestic Water Supply criterion by multiplying the flow values along the curve by the applicable water quality criterion and converting the units to derive a load duration curve of tons of sulfate per day. This load curves represent the TMDL since any point along the curve represents water quality for the standard at that flow. Historic excursions from the water quality standard are seen as plotted points above the load curve. Water quality standards are met for those points plotting below the load duration curve (**Figures 7, 8 and 9**).

Site 038: Excursions were seen in each of the three defined seasons and are outlined in **Table 1**. Fifty seven percent of Spring samples and 64% of Summer-Fall samples were over the domestic supply criterion. Eighty three percent of Winter samples were over the criterion. Overall, 69% of the samples were over the criteria. This would represent a baseline condition of non-support of the impaired designated use.

Table 1
NUMBER OF SAMPLES OVER SULFATE STANDARD OF 250 mg/L BY FLOW AND SEASON

Station	Season	0 to 10%	10 to 25%	25 to 50%	50 to 75%	75 to 90%	90 to 100%	Cum Freq.
Whitewater River near Towanda (038)	Spring	1	5	6	7	2	0	21/37 = 57%
	Summer	0	1	4	6	5	2	18/28 = 64%
	Winter	0	2	15	12	8	1	38/46 = 83%

Site 106: Excursions were seen in each of the three defined seasons and are outlined in **Table 2**. Thirteen percent of Spring samples and 14% of Summer-Fall samples were over the domestic supply criterion. Forty five percent of Winter samples were over the criterion. Overall, 26% of the samples were over the criteria. This would represent a baseline condition of non-support of the impaired designated use.

Table 2
NUMBER OF SAMPLES OVER SULFATE STANDARD OF 250 mg/L BY FLOW AND SEASON

Station	Season	0 to 10%	10 to 25%	25 to 50%	50 to 75%	75 to 90%	90 to 100%	Cum Freq.
Walnut River at Gordon (106)	Spring	0	0	1	2	1	1	5/38 = 13%
	Summer	0	0	0	2	1	1	4/29 = 14%
	Winter	0	0	2	10	9	0	21/47 = 45%

Site 704: Excursions were seen in each of the three defined seasons and are outlined in **Table 3**. Twenty five percent of Spring samples and 33% of Summer-Fall samples were over the domestic supply criterion. Eighty percent of Winter samples were over the criterion. Overall, 50% of the samples were over the criteria. This would represent a baseline condition of non-support of the impaired designated use.

Table 3
NUMBER OF SAMPLES OVER SULFATE STANDARD OF 250 mg/L BY FLOW AND SEASON

Station	Season	0 to 10%	10 to 25%	25 to 50%	50 to 75%	75 to 90%	90 to 100%	Cum Freq.
Eightmile Creek near Douglas (704)	Spring	1	0	0	0	0	0	1/4 = 25%
	Summer	0	0	1	0	0	0	1/3 = 33%
	Winter	0	0	1	3	0	0	4/5 = 80%

Desired Endpoints of Water Quality (Implied Load Capacity) at Sites 038, 106 and 704 over 2007 - 2011

The ultimate endpoint for this TMDL will be to achieve the Kansas Water Quality Standards fully supporting Drinking Water Use. This TMDL will, however, be phased. The current standard of 250 mg/L of sulfate was used to establish the TMDL. However, the Walnut River system is subject to loading of sulfate from underlying Permian geologic formation and their high gypsum content in the watershed. As such, the watershed's main stem and many of its tributaries have elevated sulfate levels from this natural source. This natural background of sulfate, consistently above 250 mg/L, makes achievement of the Standard impossible for all flow conditions at Sites 038 and Site 704. The average sulfate concentration at Site 106 for flows greater and less than the median is not significantly different from the Phase One endpoint, therefore, the 250 mg/l endpoint will apply to all flows at Site 106. At Sites 038 and 704, since the Standard is not achievable because of natural contributions to the sulfate load, an alternative endpoint is needed. Additionally, there has not been a point of diversion for potable water present on these streams to activate the domestic water criteria. Most water use is by well or from El Dorado Reservoir.

Kansas Implementation Procedures for Surface Water allow for a numerical criterion based on natural background to be established from flows less than median in-stream flow. The specific stream criteria to supplant the general standard will be developed concurrent with Phase One of this TMDL following the appropriate administrative and technical Water Quality Standards processes. Meanwhile, a tentative endpoint has been developed from currently available information at water quality monitoring sites 038 and 704. The average sulfate concentration at Site 038 for flows less than the median flow is 387 mg/L and sets the tentative endpoint for this site. The average sulfate concentration at Site 704 is 521 mg/L for flows less than the median flow and sets the tentative endpoint for this Site. The Phase Two TMDL will be based on the future standard applied to these flows within the contributing portions of the Walnut River watershed to Sites 038 and 704. Additionally, these endpoints are to be achieved upon initiation of use of these impaired streams for potable consumption, through a constructed point of diversion.

Seasonal variation has been incorporated in this TMDL through the documentation of the seasonal consistency of elevated sulfate levels. Achievement of the endpoints indicate loads are within the loading capacity of the stream, water quality standards are attained and full support of the designated uses of the stream has been restored.

3. SOURCE INVENTORY AND ASSESSMENT

Background Conditions: The Permian bedrock underlying all of the Whitewater River and Lower Walnut subbasins contains varying amounts of gypsum (hydrated calcium sulfate) in the subsurface. The primary bedrock underlying the soil or outcropping at the surface in the western third of the Whitewater River subbasin and the upper parts of the watersheds of Fourmile, Eightmile (Site 704), and Polecat creeks is the lower part of the Wellington Formation. The Wellington bedrock in the watershed is predominantly shale with minor amounts of limestone, dolomite, gypsum, and anhydrite. The anhydrite (anhydrous calcium sulfate) occurs at a greater depth than the gypsum, where meteoric water has not yet penetrated sufficiently to hydrate it to gypsum. In some cases, the gypsum beds are near the surface or in outcrops of the Wellington. The gypsum is highly soluble and can result in ground waters containing a sulfate concentration up to 1,700 mg/L. The West Branch of the Whitewater River and other tributaries entering the west side of the Whitewater River and the upper portions of Fourmile, Eightmile, and Polecat creeks flow across areas where the Wellington Formation outcrops or underlies the soil and alluvial sediment. Sulfate contents of these streams are the highest in the Whitewater and Lower Walnut subbasins. For example, sulfate levels exceeding 800 mg/L have been observed during low flow in Gypsum and Prairie creeks in the Whitewater River watershed and in Fourmile Creek in the Lower Walnut subbasin. The low flows of small tributaries such as Badger Creek that have little or no Wellington Formation within their watersheds generally have sulfate concentrations below 250 mg/L. The upper part of Dry Creek (segment 27, just south of Whitewater Creek) is expected to have a sulfate content that exceeds 250 mg/L during low flows because the creek crosses the area of the Wellington Formation. The sulfate concentration does not generally exceed 250 mg/L below Augusta Sante Fe Lake because storm runoff captured by the lake dilutes the mineralized water of the baseflow.

Older Permian bedrock of the Chase Group outcrops or underlies the soils and alluvium in the central and eastern parts of the Whitewater River watershed and the Lower Walnut basin. The bedrock consists primarily of alternating limestones and shales. Thin beds and fracture fillings of gypsum occur in the subsurface in some of the limestones and shales. Although the amount of gypsum is much smaller than in the Wellington Formation, there are sufficient quantities to substantially raise the sulfate concentration of ground waters in the Chase Group in the Whitewater River watershed. The highest sulfate concentrations observed in the tributaries entering from the east of the Whitewater River are in the upper part of the watershed, such as in Diagonal Creek (between the East Branch of the Whitewater River and Fourmile Creek) Tributaries entering the east side of the Whitewater River south of Fourmile Creek (starting with Rock Creek) have baseflows in which the sulfate does not exceed 250 mg/L. This explains the general decrease in sulfate concentration downstream in the Whitewater River based on historic data profiles of the river water. Ground waters in the Chase Group in the Lower Walnut subbasin generally contain lower sulfate concentration than in the upper parts of the Whitewater River watershed. In general, the major tributaries on the east side of the Lower Walnut subbasin have the lowest sulfate concentration of all the major tributaries in the Whitewater River and Lower Walnut subbasins. Streamflow in the Walnut River upstream of the confluence with the Whitewater River has sulfate concentrations much less than in the Whitewater River, and acts, along with the tributaries on the east side of the Lower Walnut basin, to dilute the high sulfate levels entering the Walnut River from the Whitewater River and west-side tributaries.
Although high sulfate concentrations can be correlated with high chloride contents in a few

tributaries, this relationship is not an indicator of the natural occurrence of the sulfate. The origin of the high chloride concentrations in low flows of a few creeks is the slow discharge of oil-field brine that polluted ground waters in the earlier years of the oil and gas industry. The Hutchinson Salt Member that occurs in the Wellington Formation in the subsurface farther to the west is not present within the Whitewater River watershed and the Lower Walnut subbasin. The sulfate and chloride correlation in a few tributaries is due to the coincidence of higher concentrations of both sulfate and chloride in the ground-water discharge. In addition, the increase in the ionic strength of the ground water by the saltwater contamination from oil brine can result in greater dissolution of gypsum. Thus, the slow dilution and flushing of past oil-brine pollution with time could result in small decreases in sulfate contents in ground waters with the highest sulfate contents.

Irrigation Return Flows: Aggravation or impairment associated with irrigation return flows in this watershed is essentially non-existent. Irrigation reports from groundwater sources in 1998 indicate only 151 acres, mostly golf courses, were irrigated in the watershed. Return flows, if any, via groundwater discharge to tributaries or the main stem in the watershed from those diversions would be negligible at most.

NPDES: There are a total of 14 of municipal, commercial and industrial NPDES sites authorized to discharge upstream of the monitoring sites located within the watershed (**Table 4 and Figure 6**). Yet, any anthropogenic sulfate sources or hydrologic modifications increasing the sulfate concentration would be minor in comparison with the natural sulfate source in the watershed.

Table 4

DISCHARGING FACILITY	STREAM REACH	SEG-MENT	DESIGN FLOW	TYPE	AVG S04 (mg/L)
Andover WTF	Four Mile Cr	16	1.2 mgd	Mech.	114
Augusta WTP	Walnut River	2	1.5 mgd	Mech.	24
Benton WTF	W. Br Whitewate R	24	0.071 mgd	Lagoon	14.5
Elbing WTF	Henry Cr	33	0.029 mgd	Lagoon	34
Rose Hill WTF	Eight Mile Cr	30	0.39 mgd	Lagoon	114
Towanda WTF	Whitewater R	18	0.19 mgd	Mech.	14.5
Whitewater WTF	W. Br Whitewate R	25	0.162 mgd	Mech.	14.5
Wichita (Four Mile Cr)	Four Mile Cr	16	1.5 mgd	Mech.	114
KS Trnpk Auth (Towanda)	Whitewater R	18	0.0116 mgd	Lagoon	14.5
Sherwin Williams	Four Mile Cr	16	0.0104 mgd	Cooling	No Data
Central Paving	Whitewater R	18		Quarry	No Rptd Disch
Martin Marietta Aggreg.	Whitewater R	18		Quarry	No Rptd Disch
Coastal Refining	W. Br Whitewater R	24	0.022 mgd	GW Rem.	No Data
Lubrication Engineers	Whitewater R	21	0.23 mgd	GW Rem.	1,500

Walnut River Watershed
Sulfate TMDL
NPDES Map

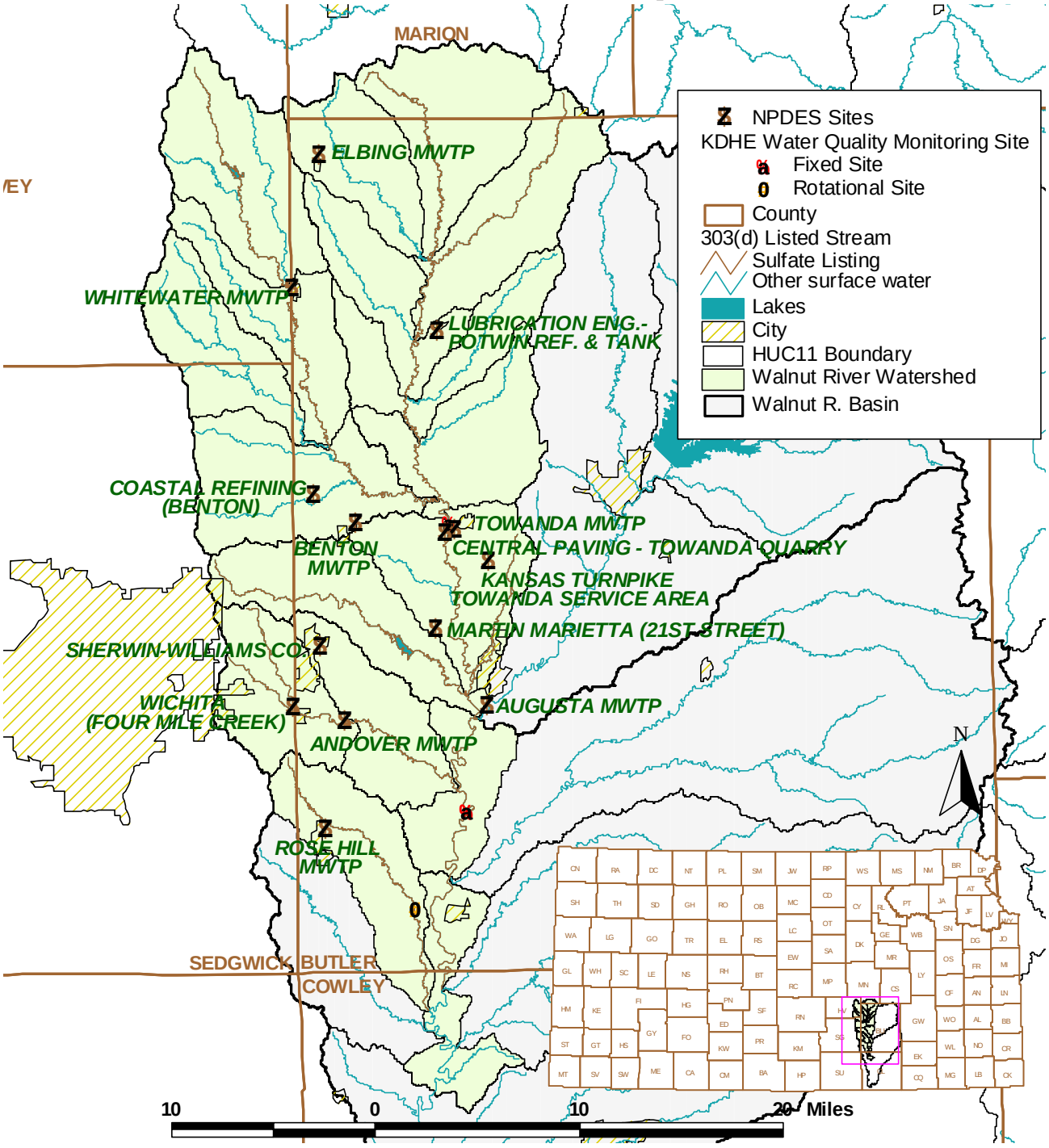

Figure 6

Since very few NPDES sites do not currently monitor for sulfate in their effluent, average sulfate concentrations for municipal sources were estimated based on the sulfate in their source waters. The city of Wichita's effluent sulfate concentration is about 114 mg/L while their average source water sulfate is about 68 mg/L. This ratio was used to estimate the sulfate in effluent from the other cities in the watershed.

There are two groundwater remediation projects in the watershed. There is little to no data on the sulfate concentration in the effluent discharged from these projects. For example, the Lubrication Engineers near Potwin has reported a single sulfate reading (1,500 mg/L) since 2000. The Costal Refining project is not currently required to monitoring for sulfate.

4. ALLOCATION OF POLLUTION REDUCTION RESPONSIBILITY

The source assessment has ascertained that natural sulfate loading within the watershed is overwhelmingly responsible for the excursions seen at the monitoring sites located within the Walnut River watershed.

Point Sources: The following Wasteload Allocations shall only apply upon initiation of the use of these surface waters for potable supply through a constructed point of diversion.

Site 038: Based on an estimated discharge volume from all point sources contributing to site 038 of 0.8 cfs, a Wasteload Allocation of 0.54 tons sulfate per day will be established by this TMDL at the 250 mg/L standard. Pursuant to Kansas implementation procedures for wastewater permitting, should the elevated background concentration be established at 387 mg/L, the WLA would increase 0.83 tons per day (**Figure 7**). Table 5, used to estimate wasteload allocations, is given in the attached appendix.

Site 106: Based on an estimated discharge volume from all point sources contributing to site 106 (6.8 cfs) plus the upstream sources from site 038 (0.8 cfs), a Wasteload Allocation of up to 5.14 tons per day will be established by this TMDL at the 250 mg/L standard (**Figure 8**). Table 5, used to estimate wasteload allocations, is given in the attached appendix.

Site 704: Based on an estimated discharge volume from the point source contributing to site 704 (0.6 cfs), a WLA of up to 0.41 tons per day will be established by this TMDL at the 250 mg/L standard. Pursuant to Kansas implementation procedures for wastewater permitting, should the elevated background concentration be established at 521 mg/L, the WLA would increase up to 0.41 tons per day (**Figure 9**). Table 5, used to estimate wasteload allocations, is given in the attached appendix.

Non-Point Sources: The elevated sulfate concentrations predominately stem from background geologic sources.

Site 038: The Load Allocation based on the existing standard of 250 mg/L across all flow conditions is shown in **Figure 7** and is 24.4 tons sulfate per day at median flow (36 cfs). The LA using a background sulfate concentration of 387 mg/L is 37.7 tons per day at median flow for this site.
Site 106: The Load Allocation based on the existing standard of 250 mg/L across all flow conditions is shown in **Figure 8** and is 84.6 tons per day at median flow (125.3 cfs).

Site 704: The Load Allocation based on the existing standard of 250 mg/L across all flow conditions is shown in **Figure 9** and is 3.34 tons per day at median flow (5 cfs). The LA using a background sulfate concentration of 521 mg/L is 7 tons per day at median flow for this site.

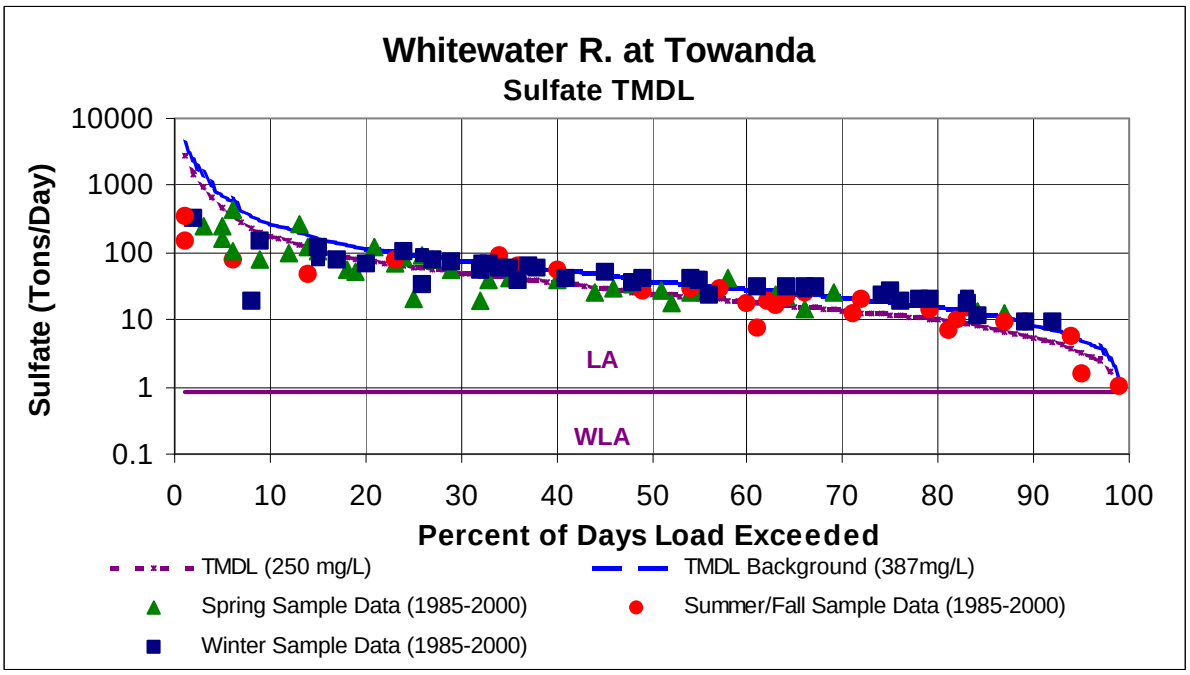

Figure 7

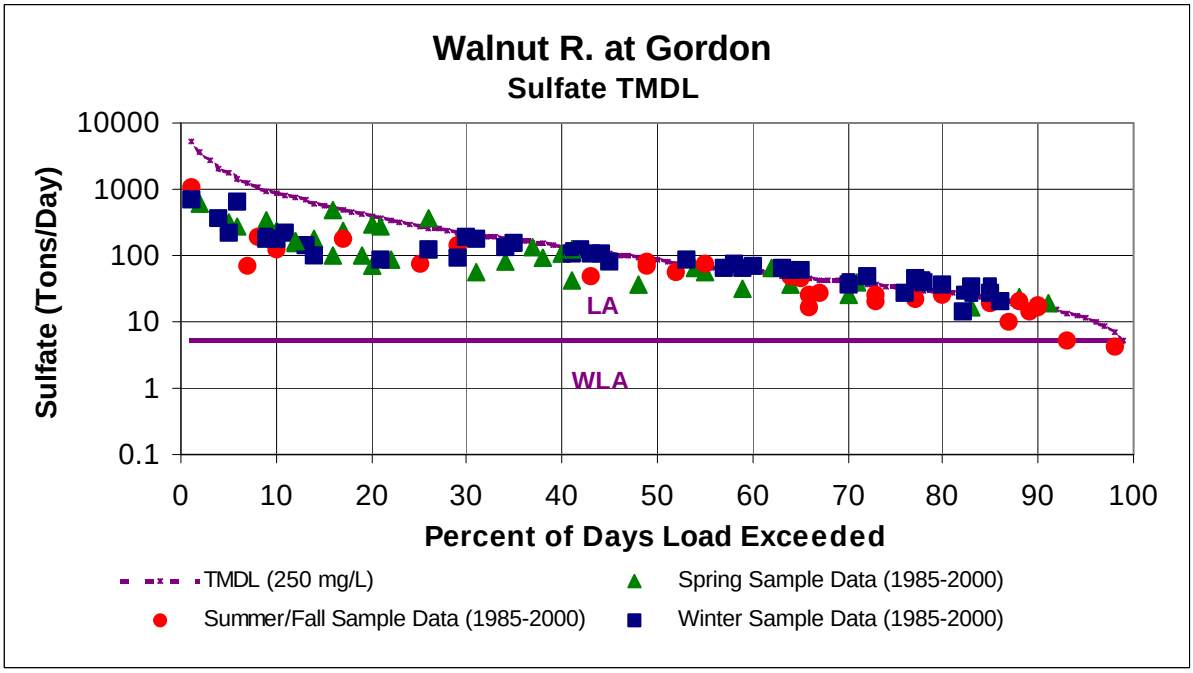

Figure 8

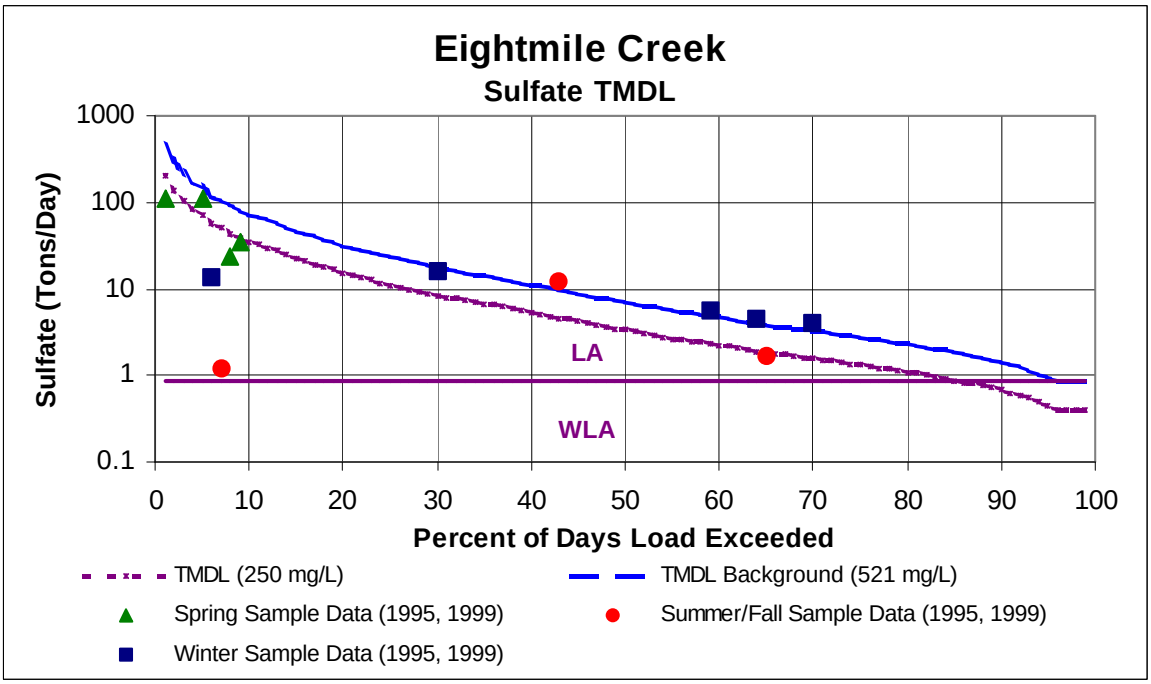

Figure 9

Defined Margin of Safety: The Margin of Safety provides some hedge against the uncertainty of loading and the sulfate endpoints for the Walnut River system. Since the critical maximum sulfate concentration occurs at winter base flows and the current background estimates are lower than this critical winter sulfate level, the margin of safety is considered implicit in this TMDL.

State Water Plan Implementation Priority: Because it appears this watershed's sulfate load is predominately from natural geologic sources, this TMDL will be a Low Priority for implementation.

Unified Watershed Assessment Priority Ranking: This watershed lies across the Upper Walnut Basin (HUC 8: 11030017) with a priority ranking of 44 (Medium Priority for restoration work) and the Lower Walnut Basin (HUC 8: 11030018) with a priority ranking of 42 (Medium Priority for restoration work)

Priority HUC 11s and Stream Segments: Because of the natural geologic contribution of this impairment, no priority subwatersheds or stream segments will be identified.

5. IMPLEMENTATION

Desired Implementation Activities

1. Monitor any anthropogenic contributions of sulfate loading to river.
2. Establish alternative background criterion.
3. Assess likelihood of river being used for domestic uses.

Implementation Programs Guidance

NPDES and State Permits - KDHE

a. Municipal, industrial and commercial permits for facilities in the watershed will be renewed after 2004 with sulfate monitoring and any appropriate permit limits which protects the domestic water supply criteria at any emerging point of diversion on these streams.

Non-Point Source Pollution Technical Assistance - KDHE

a. Evaluate any potential anthropogenic activities which might contribute sulfate to the river as part of an overall Watershed Restoration and Protection Strategy.

Water Quality Standards and Assessment - KDHE

a. Establish background levels of sulfate for the river and tributaries.

Use Attainability Analysis - KDHE

a. Consult with Division of Water Resources on locating existing or future domestic points of diversion on the Walnut River for drinking water purposes.

Timeframe for Implementation: Development of a background level-based water quality standard should be accomplished with the 2002 water quality standards revision.

Targeted Participants: Primary participants for implementation will be KDHE.

Milestone for 2007: The year 2007 marks the mid-point of the ten year implementation window for the watershed. At that point in time, additional monitoring data from Walnut River will be reexamined to confirm the impaired status of the river and the suggested background concentration. Should the case of impairment remain, source assessment, allocation and implementation activities will ensue.

Delivery Agents: The primary delivery agents for program participation will be the Kansas Department of Health and Environment.

Reasonable Assurances:

Authorities: The following authorities may be used to direct activities in the watershed to reduce pollution.

1. K.S.A. 65-164 and 165 empowers the Secretary of KDHE to regulate the discharge of sewage into the waters of the state.

2. K.S.A. 65-171d empowers the Secretary of KDHE to prevent water pollution and to protect the beneficial uses of the waters of the state through required treatment of sewage and established water quality standards and to require permits by persons having a potential to discharge pollutants into the waters of the state.

3. K.S.A. 82a-901, et seq. empowers the Kansas Water Office to develop a state water plan directing the protection and maintenance of surface water quality for the waters of the state.

4. K.S.A. 82a-951 creates the State Water Plan Fund to finance the implementation of the *Kansas Water Plan.*

5. The *Kansas Water Plan* and the Lower Arkansas Basin Plan provide the guidance to state agencies to coordinate programs intent on protecting water quality and to target those programs to geographic areas of the state for high priority in implementation.

Funding: The State Water Plan Fund, annually generates $16-18 million and is the primary funding mechanism for implementing water quality protection and pollution reduction activities in the state through the *Kansas Water Plan*. The state water planning process, overseen by the Kansas Water Office, coordinates and directs programs and funding toward watersheds and water resources of highest priority. Typically, the state allocates at least 50% of the fund to programs supporting water quality protection. This watershed and its TMDL are a Low Priority consideration and should not receive funding.

Effectiveness: Minimal control can be exerted on natural contributions to loading.

6. MONITORING

KDHE will continue to collect bimonthly samples at Station 038 and 106 and rotational Station 704, including sulfate samples, in each of the three defined seasons. Based on that sampling, the priority status will be evaluated in 2006 including application of numeric criterion based on background concentrations. Should impaired status remain, the desired endpoints under this TMDL will be refined and direct more intensive sampling will need to be conducted under specified seasonal flow conditions over the period 2007-2011.

Monitoring of sulfate levels in effluent will be a condition of NPDES and state permits for facilities. This monitoring will continually assess the functionality of the systems in reducing sulfate levels in the effluent released to the streams.

7. FEEDBACK

Public Meetings: Public meetings to discuss TMDLs in the Walnut Basin were held January 10 and March 7, 2002 in Augusta. An active Internet Web site was established at http://www.kdhe.state.ks.us/tmdl/ to convey information to the public on the general establishment of TMDLs and specific TMDLs for the Walnut Basin.

Public Hearing: A Public Hearing on the TMDLs of the Walnut Basin was held in Augusta on June 5, 2002.

Basin Advisory Committee: The Walnut Basin Advisory Committee met to discuss the TMDLs in the basin on October 4, 2001, January 10 and March 7, 2002.

Milestone Evaluation: In 2007, evaluation will be made as to the degree of implementation which has occurred within the watershed and current condition of Eightmile Creek, the Whitewater and Walnut Rivers. Subsequent decisions will be made regarding the implementation approach and follow up of additional implementation in the watershed.

Consideration for 303(d) Delisting: The stream will be evaluated for delisting under Section 303(d), based on the monitoring data over the period 2007-2011. Therefore, the decision for delisting will come about in the preparation of the 2012 303(d) list. The modifications made to the applicable water quality criteria during the ten-year implementation period may accelerate consideration for delisting and/or necessitate the need for revisions to the desired endpoints of this TMDL and implementation activities.

Incorporation into Continuing Planning Process, Water Quality Management Plan and the Kansas Water Planning Process: Under the current version of the Continuing Planning Process, the next anticipated revision will come in 2003 which will emphasize implementation of TMDLs. At that time, incorporation of this TMDL will be made into both documents. Recommendations of this TMDL will be considered in *Kansas Water Plan* implementation decisions under the State Water Planning Process for Fiscal Years 2003-2007.

Walnut River Sulfate TMDL, Appendix

Table 5

Site 038	mg/L	mg/L	mg/L	cfs				
Pt Source	Source Water (SO4)	Effluent (SO4)	Est Eff (SO4)	Design Flow	Sulfate (tons/day)			
Costal Refining		1500 (est)		0.034	0.1377			
Lubrication Engineers		1500		0.36	1.458			
Benton	7.2		12.1	0.11	0.0021	Current Sulfate	250mg/L Sulfate	387mg/L Sulfate
Elbing	17		28.5	0.045	0.0021	Load tons/day	Load tons/day	Load tons/day
Whitewater	7.2		12.1	0.25	0.0049			
				0.80	1.64	**1.64**	0.54	0.83

Site 106	mg/L	mg/L	mg/L	cfs			
Pt Source	Source Water (SO4)	Effluent (SO4)	Est Eff (SO4)	Design Flow	Sulfate (tons/day)		
Upstream Pt Sources				0.799	1.64		
Wichita (Fourmile Cr)	68	114		2.32	0.7141		
Andover	68		114.0	1.86	0.5725		
Augusta	12		20.1	2.32	0.1260		
Towanda	7.2		12.1	0.29	0.0095	Current Sulfate	250mg/L Sulfate
KTA-Twnda	7.2		12.1	0.0116	0.0004		
Sherwin Williams	1500(est)			0.016	0.0648	Load tons/day	Load tons/day
				7.62	3.12	**3.12**	5.14

Site 704	mg/L	mg/L	mg/L	cfs		Current Sulfate	250mg/L Sulfate	521mg/L Sulfate
Pt Source	Source Water (SO4)	Effluent (SO4)	Est Eff (SO4)	Design Flow	Sulfate (tons/day)	Load tons/day	Load tons/day	Load tons/day
Rose Hill	68		114.0	**0.6**	0.18	**0.18**	0.41	0.84